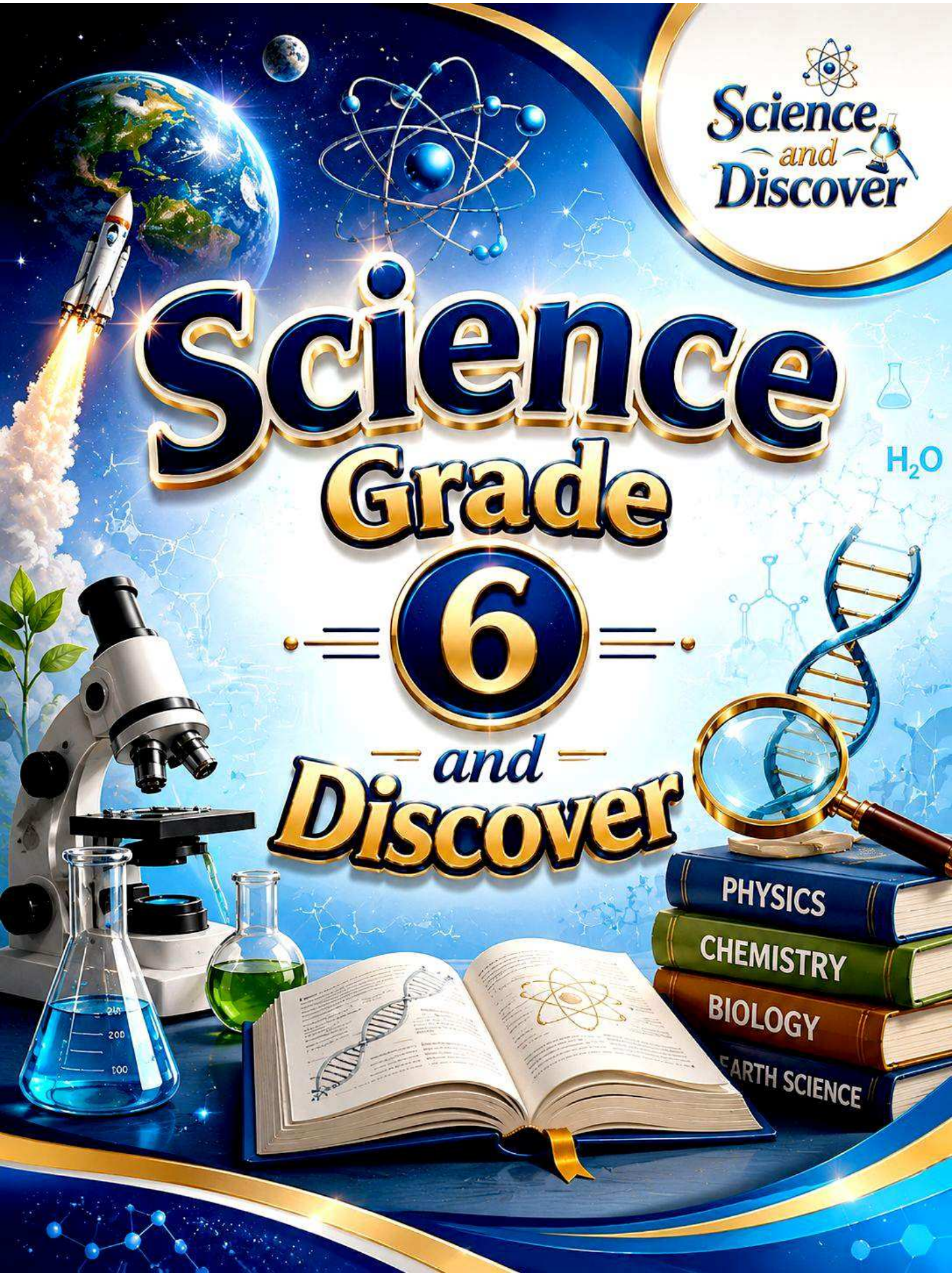


D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

COMBUSTION CONDITIONS

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

Air and the Burning of Things

1-1

Gas stove

QUESTION

1- Is air necessary for combustion to occur?

☐ No ☐ Yes

2- Does a lit candle go out when the jar it is in is covered?

☐ Yes ☐ No

Air renewal and the continustion of combustion:

A Air is necessary for combustion to occur and continue.

B Because without air, combustion does not occur and does not continue.

Conditions for combustion to occur and continue:

1. A flow of renewed air is necessary for combustion to occur and continue.
2. When the air flow stops or when the air is consumed, combustion does not continue and stops.
3. **Example:** When a lit candle is placed in an open container, the candle remains ilt because air rushes into the candle flame.
4. When a container with a lit candle is covered, the candle goes out after a while.
5. Because the air inside the container is exhausted as soon as it is consumed.

Conditions

1. There must be fuel (something that can burn).
2. There must be oxygen (air). If the sir stops, the fire goes out.
3. There must be heat (enough temperature to start the fire).

The candle consumed the air

Because the air inside the container is used up, the candle flame cannot continue.

Continued burning of the candle

Renewed air flows around the flame, so combustion continues.

Examples

- When the jar is open, air keeps coming in and the candle stays iit.
- When the jar is covered, the air cannot get in and the candle goes out.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

6 The Importance of Air in Combustion

Activity

1 Spread the clay on the wooden board.

2 Insert the candle into the clay and light it.

Place the jar and metal lid on top of the candle.

3 **Observation:** The candle goes out shortly after being covered.

Explanation: The candle consumes the air trapped inside the jar until it is exhausted, so the candle goes out after a while.

4 Cut a piece of clay at the bottom of the jar to allow air in, then light the candle again.

Observation: The candle burns with a faint flame.

Explanation: A small amount of air allows the combustion process to continue.

5 Remove the metal lid from the top of the jar.

Observation: The candle burns brighter.

Explanation: Increasing the amount of air entering the candle increases the combustion process.

Materials:

1. Wooden board

2. Clay

3. Candle

4. Candle holder

5. Metal lid

6. Lighter (match)

7. Bottomless jar

8. Trash can

Steps:

1. Spread the clay on the wooden board.
2. Insert the candle into the clay and light it. Place the jar and metal lid on top of the candle (as shown in the picture).
3. **Observation:** The candle goes out shortly after being covered.

   Explanation: The candle consumes the air trapped inside the jar until it is exhausted, so the candle goes out after a while.
4. Cut a piece of clay at the bottom of the jar to allow air in, then light the candle again.

   Observation: The candle burns with a faint flame.

   Explanation: A small amount of air allows the combustion process to continue.
5. Remove the metal lid from the top of the jar.

   Observation: The candle burns brighter.

   Explanation: Increasing the amount of air entering the candle increases the combustion process.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

THE ROLE OF OXYGEN 2-1

Let's Explore

1. Is the air we breathe a mixture of several gases? Yes ☐ No ☐
2. Does oxygen represent the largest percentage of the air components? Yes ☐ No ☐

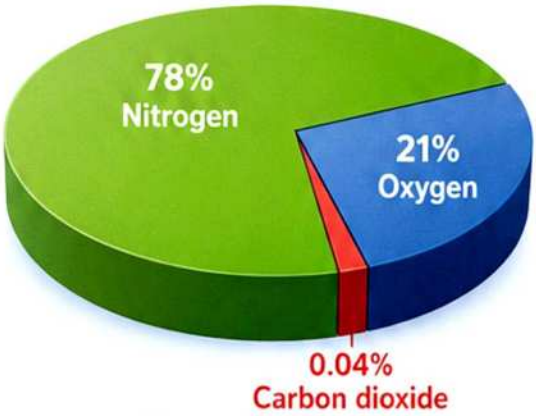
- The air we breathe around the Earth is essential for our continuous life on the Earth's surface.

Concepts

Air: A mixture of several different gases in unequal proportions (percentages).

Components of Air

Air consists of three main gases:



Components of Air

1. **Nitrogen gas:**
   Represents about (78%) of the volume of air.
2. **Oxygen gas:**
   Represents about (21%) of the volume of air.
3. **Carbon dioxide gas:**
   Represents about (0.04%) of the volume of air.

Note

There are other gases that represent a very small percentage of the volume of air.

The Gas that Helps with Combustion

Oxygen gas helps in the combustion process, while nitrogen gas and carbon dioxide gas do not help with combustion, but they have other important uses.

★ **Oxygen gas:** One of the most important components of air, representing about (21%) of the volume of air, or $\frac{1}{5}$.

★ **Importance of oxygen gas:**

1. Essential for the combustion process (burning) of different materials.
2. Essential for the respiration process in all living organisms.

Renewable Energy

Instead of burning coal and oil to obtain energy,

Egypt is interested in using renewable energy sources

such as the sun, wind, and others to obtain energy.

Benban Solar Power Station

Benban Solar Power Plant

It is a giant solar power station. It is located in the village of Benban, 35 km from the city of Aswan.

The importance of the Benban Solar Power Station:

Generating clean electricity without burning fuel, thus reducing carbon dioxide emissions.

Concept

Combustion (burning): The process of combining a material with oxygen.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

Discover Which Gases Help Combustion

ACTIVITY

Materials

1. 3 Candles
2. Candle holder
3. Gas lighter
4. Basin of water
5. 3 Jars
6. 3 Glass lids
7. Cylinder of oxygen
8. Cylinder of nitrogen
9. Flexible straw
10. Cylinder of carbon dioxide

Steps

1. Place equal amounts of the following gases in three jars:
   Nitrogen
   Oxygen
   Carbon dioxide
2. Place a lit candle inside each jar.
3. Observe the candles.

Observation:

- The candle goes out in jars (1) and (3).
- The candle remains lit in jar (2), which contains oxygen.

Explanation:

Oxygen is necessary for combustion to occur and continue.

While nitrogen and carbon dioxide do not support combustion.

How can the gas be collected?

Any gas, such as oxygen, can be collected in a jar by:

- Turning the jar filled with water upside down until it is 70% filled with the gas.
- Then placing the lid on the jar.

Collecting oxygen gas

Note:

This method works for gases that are not too soluble in water.

Key Takeaway Only oxygen supports combustion. Nitrogen and carbon dioxide do not.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

Air After Combustion 3-1

Question 2

No ☐ Yes ☐ 1. Nitrogen gas is produced from the combustion of materials.

No ☐ Yes ☐ 2. Clear limewater changes color when oxygen gas passes through it.

Change in the composition of air after combustion:

You learned in the previous lesson that: Oxygen gas is necessary for the combustion process to occur.

When materials burn:

O_2 Part of the oxygen gas in the air is consumed, so the percentage of oxygen in the air decreases.

CO_2 And the combustion process produces carbon dioxide gas, so its percentage in the air increases.

Products of the combustion process

Cloudiness of clear limewater

Detecting the presence of carbon dioxide gas:

Clear limewater is used to detect the presence of carbon dioxide gas.

When carbon dioxide gas passes through clear limewater, the clear limewater becomes cloudy

as the clear limewater turns into a white liquid resembling milk.

Explanation: Carbon dioxide gas reacts with clear limewater and produces a new white substance.

Concepts? Clear limewater: A transparent, colorless liquid that becomes cloudy when it reacts with carbon dioxide gas.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

Checking for Changes in Air Using Limewater

ACTIVITY

Jar with candle

Jar without a candle

The jar after removing the candle

Testing air changes using limewater:

Materials:

1. Candle
2. Candle holder
3. Clear limewater
4. Metal lids
5. Gas lighter
6. Two jars
7. Safety goggles

Steps:

1. Place an appropriate amount of clear limewater in each jar.
2. Place a lit candle in one of the jars. Then cover the jar with the metal lid and wait until the candle goes out.
3. Remove the candle from the jar and shake both jars well.

Observation:

1. The clear limewater in the first jar turns a milky white color (becomes cloudy).
2. The limewater in the second jar is unaffected.

Explanation:

When the candle is lit, carbon dioxide gas is produced which reacted with the clear limewater and formed a new white substance resembling milk.

Carbon dioxide (CO_2) + Clear limewater → Milky white limewater

Conclusion:

1. Carbon dioxide gas is produced from the combustion of materials.
2. Carbon dioxide gas clouds the clear limewater.

Caution: It is necessary to wear protective eyewear during the experiment so that the limewater does not get into your eyes.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

Second: Gas monitoring device: It is a meter equipped with a sensor that displays the percentage (%) of the gas.

The gas to be detected is displayed on the screen as numbers.

Gas monitoring device

Notice

- There are types of gas monitoring devices that measure the percentage of oxygen gas.
- And the percentage of carbon dioxide gas at the same time.
- This type of digital gas monitoring device is found in hospitals in intensive care units for patients with breathing problems.
- The glass tube is for single use only.
- Be careful not to touch the broken ends of the gas pipe to avoid injury.

Combustion and the Future of Energy

Enrichment Column

Fire discovery

First: The discovery of fire and ancient Egyptian civilization:

- The discovery of fire was a key factor in civilization and human progress.

All things need oxygen gas in order to burn.

How did the ancient Egyptians obtain light?

Ancient Egyptians used vegetable oils and animal fats to light temples and pyramids.

The ancient Egyptians used clever ideas to reduce the smoke produced by the combustion process.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

Chapter 1: Combustion Conditions

How did the Ancient Egyptians use oxygen gas in the combustion process?

Melting gold

O_2 When the percentage of oxygen increases, things burn **faster** and the **flame temperature rises.**

Egyptian craftsmen used bellows (a tool for **pumping air**) to push a larger quantity of **oxygen** onto the fire to raise the temperature of the fire used in melting gold and metals to make jewelry.

Second: Ways to Reduce Carbon Dioxide Emissions

Global Warming

CO_2 Carbon dioxide gas is produced from various combustion processes.

An increase in the percentage of carbon dioxide gas in the air raises the Earth's temperature in what is called the **greenhouse effect.**

Concept: The greenhouse effect

It is the phenomenon of rising Earth's temperature due to an increase in the percentage of carbon dioxide gas in the air.

Renewable Energy

Instead of burning coal and oil to obtain energy,

Egypt is interested in using renewable energy sources

such as the sun, wind, and others to obtain energy.

Benban Solar Power Station

Benban Solar Power Plant

It is a giant solar power station.
It is located in the village of **Benban**, 35 km from the city of Aswan.

The importance of the Benban Solar Power Station:

Generating clean electricity without burning fuel, thus reducing carbon dioxide emissions.

D.M.RAZK موقع الدكتور محمد رزق معلم الكيمياء التعليمي

موقع الدكتور محمد رزق التعليمي

امسح الباركود بالموبيل لتثبيت التطبيق وتحميل كل الملازم مجانا وبسرعه

MR

حمل التطبيق الأن

GET IT ON Google Play

ملازم ابتدائي | ملازم اعدادي | ملازم ثانـــوي | كورسات ونتائج امتحانات

موقع الدكتور محمد رزق
Dr.MoRizK